Organic Farming for Sustainable Agricultural Production

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Lecture – 03
Organic Farming and Its Components

So, welcome to the third lecture Organic Farming and Its Components. So, first two lectures we have discussed about the status of organic farming and what is organic farming in general. So, this lecture we will discuss the different components of this organic farming.

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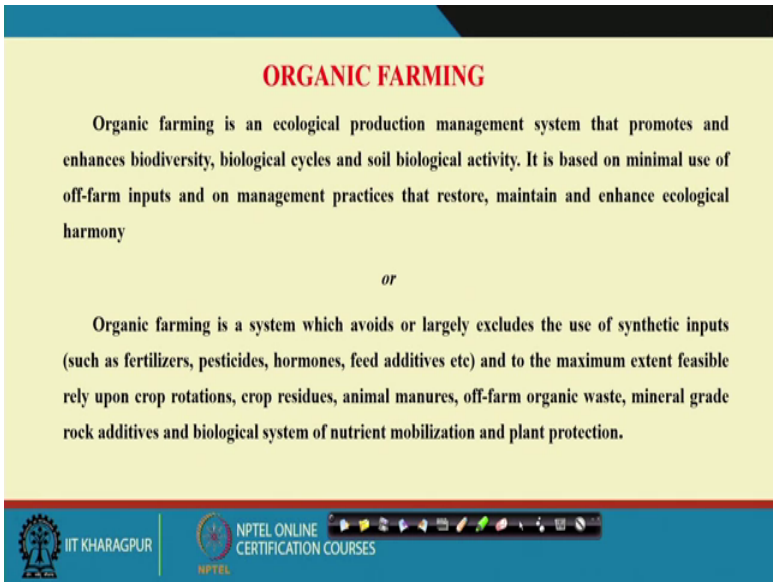

So, as we have discussed this organic farming. So, I do not want to repeat same thing because this is a biodiversity, biological cycle and soil biological activity, means organic farmings as a largely exclude the use of synthetic inputs that is fertilizers pesticides hormones or the feed additives.

And the maximum extents feasible rely on crop rotations I discussed, crop residue recycling and animal manure because cow or the cattle there is a integral part of organic farming. So, for organic farmers they must have cattle. So, that they can make their own farm organic waste recycling and converting organic waste to valuable manures and fertilizer.

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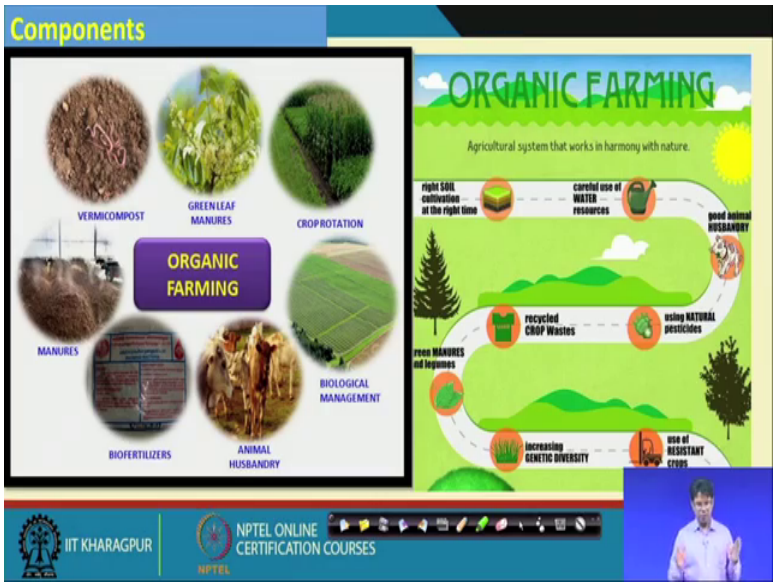

This is how you can say the organic farming, so if you see the components. So, is a vermicompost is an components of organic farming manures, bio fertilizer, animal husbandry and green leaf manuring crop rotations and biological management.

So, these are the major components of organic farming. So, green leaf manures are the crop rotations or the biological management. So, these are the management practices we follow go for the organic farming, but we have the components to keep the vermicompost, the manures bio fertilizers and animal husbandry are the integral part of organic agriculture or the organic farming systems. So, when you go for the organic the agricultural system that works a harmonic nature we want to work with nature few organic farming.

So, starting from you are the land managements you need the right cell cultivation or right time. So, this is equally applicable for the conventional farmers too because you need the soil managements. The cultivation there are different type cultivation you can go for the conventional tillage, we can go for the minimum tillage, we can go for the mulch; the mulching. Usually when you go for the organic farming we do avoid to go for the conventional tillage. The reason that if you go for the conventional tillage it because of the exposure of the soil particles to the atmosphere.

So, there is a loss of carbon as carbon dioxide, so minimum tillage or we can say the mulch organic the crop residue mulch delays where the stubble mulch tillage you can say

the crop residues should be leftover and the soil surface. So, there is a special type of tillage implements where the crop residue can be left over in soil surface. So, they have the multiple advantages like increasing infiltration of rainwater into the soil and that helps in minimizing evaporation loss of water from the soil that increases the soil erosions, soil porosity.

At the same time because at the interoperation of the crop residue it resist the fertility status of the soil. And also increases the microbial population of the soil because of the less tillage operations. And once you have the good tillage then you go for the water management the water management they also one this farming system in the integral part we want to minimize the use of water as minimum as possible. I you see the rice crop, rice crop we have a notional understanding that rice needs standing water it is not true rice does not require standing water.

It can grow well under saturation and it can produce well better yield under a saturation as compared to standing water. So, the water management has a role in organic farming so, use the precise water optimum water as need and the time of the need. Then as you discuss the good animal husbandry that is also that is a integral part of this a organic farming using natural pesticides. So, that will be discussing in classes in a other in a electro class classes how we can prepare natural pesticides, because we in organic farming we avoid the use of these synthetic pesticides.

So, using the cow manure or the in the outputs of the byproduct of the cow how this can be used for this a pesticide productions, then recycled crop wastes. So, that is very important in case of a organic farming we do not want to take out the crop waste from the after harvest from the field. Because this is a we can take out the only green portions and the rest portions straw materials should be given back the field the recycling crop waste green manures and legumes.

So, this is one of the important aspects of the cropping systems when you go for the organic farming or the organic cropping systems. So, legumes should be there crops in case of cropping system because by interoperating legumes or by having a legume crops in a cropping system it can enhance the biological nitrogen fixation in the soil. It can enhance the fertility of the soils and it also can minimize the nutrient requirement of the subsequent raft crops. So, that is why we should go for rice crops as a cereal crops they

need more amount of nitrogen. In that case if you go for the green manuring crops you can minimize the n requirement of the cereal crops to the extent of 50 percent or even more than 50 percent nutrient requirement can be minimized.

Then increasing genetic diversity that we are discussing previously because we in case organic farming we do not want a mono cropping systems or a single crop, we can have a different crops many crops at a time. So, that we can minimize the population of the pest and diseases in the field then of course, the use of resistant crops. So, we need to have the (Refer Time: 07:36) by the genetic improvement or the varieties which can have a resistance to many type of the insect pest and disease. So, these are the some of the components of this organic farming, we discussed the components as you say the crop rotations.

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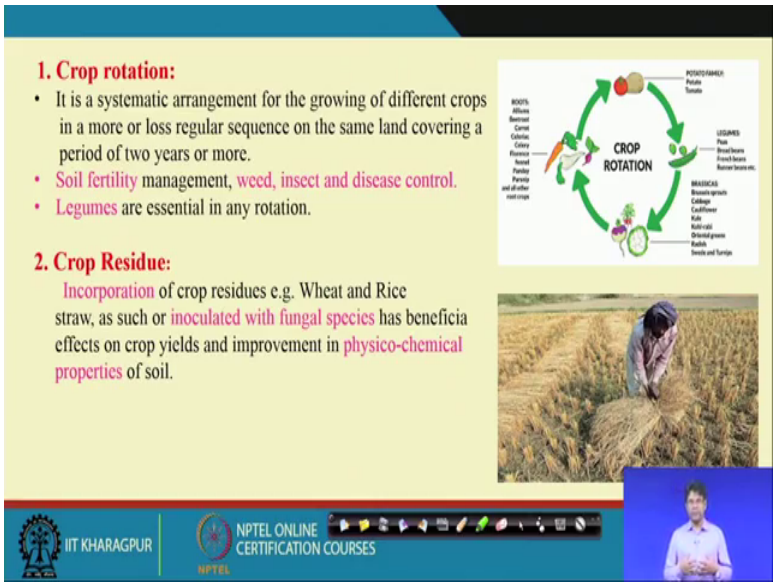

So, crop rotations so because we do not want to go same crop year after year. So, grow crops of different families like it is a systematic arrangement of the growing different crops in a more or less regular sequence. On the same land covering a period of two years or more as you go on growing, because this has a effect on the soil fertility management; weed, insect and disease control.

If you grow same crafts than the same crops the similar pest and disease they do multiply. To avoid the, reduce the pest pressures or the disease pressures, pressures on the field we need to change the crops after every seasons. Then as you discussed legumes

are essential in any rotations we must keep on legume crops if you are going for the organic farming. So, in the rotations there should be one legume crops. So, that the it can build the soil fertility and it can minimize the nutrient requirement of any cereal crops or any crops taking especially nitrogen as you see for we are concern in the yield, how we can maintain the yield.

And if you see for the yield are the production or the quantity that is driven by mainly nitrogen followed by phosphorous and potash your macronutrients. And to protect the yield or the crop we have to supply the required amount of nitrogen, phosphorous and potash and to meet the nitrogen requirement, if you take legume crops. So, legume crops do help in building the soil fertility and increasing the available nitrogen status in the soils. So, that we can protect the yield or we can we can attain the target yield of the crops and that can be farming having legumes and (Refer Time: 09:40) rotations.

And the crop residue; so as you say so there are the given tech methods so, as you are growing the crops as we I am growing the crop in the field. So, this soil has given some output that output is your crop as a straw materials and the grains we can take the grains for a own conjunction, but this straw are the crop residues they should be turned back into the soil they should be given back in the soil. So, that it restores the soil fertility it improves the soil biota the living organisms. So, then like wheat and rice trusses or this can be some straws they need some fungal species inoculation so, that they can be decomposed faster having the high CN ratio those straw materials having a low CN ratio like legume residues.

So, the they decompose very quickly but this straw residues CN ratio is 80 or a higher in that case we have to inoculate with some fungal species so that the decomposition becomes faster. So, that helps in improvement in physiochemical chemical properties of soil.

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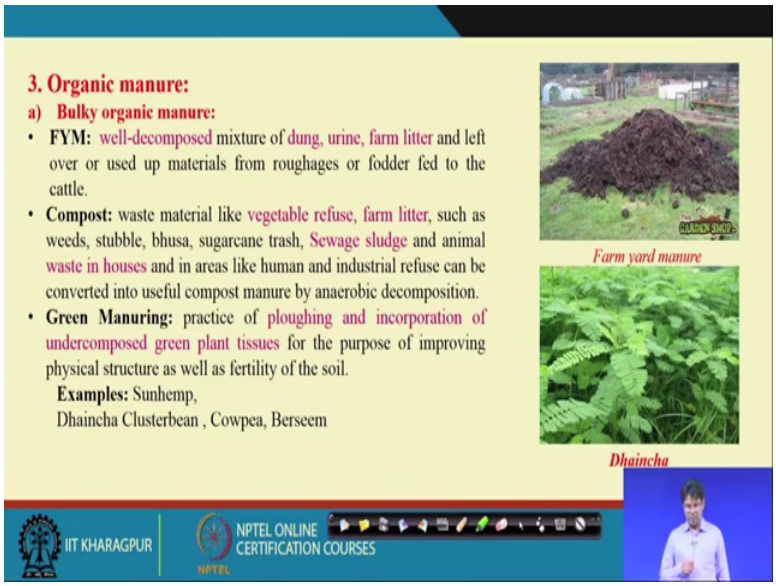

Then I have the organic manures as the part of this organic integral part of the organic farming because we need to have the own manures. You have the bulky organic manures like you are farm yard manures. So, that is a well decomposed mixture of the cow dung, urine and farm litter and leftover are the used crop materials from roughages or the fodder fed to the cattles. So, this we usually farmers earlier I have discussed. So, they are using only farm yard manures.

And then later on you are using compost decomposed any the kitchen waste from the built to refuse or the farm litters weeds and the crop waste. They can be sewage sludge also they can be made composting by the anaerobic decomposition process we can make the compost. And the green manuring as we are discussing now so, that is one of the important aspects of organic farming specially if you are going for the cereal crops they require the huge amount of nitrogen specially organic farming organic rice productions.

So, before having the rice you are going for the organics we should go for the green manure crops Dhaincha by growing dhaincha like you are the dhanicha sunhemp or the Cowpea Berseem these are green manuring crops. So, they have the root and also stem nodulating dhaincha as there. So, their nodulations that by the way the after 45 to 60 days they can be plod back into the soil by the way they can are nutrient specially nitrogen requirement of the crop can be minimized by growing a dhaincha green manuring crops.

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Concentrated organic manure so as we as we are going for the organic way, we need to meet the nutrient requirement the crops to protect the yield. So, to meet the nutrient requirement of the crops, so we have we have to make the enriched organic manures like you are the oil cakes jatropha oil cakes, pongamia oil cakes or the cottonseed oil cakes. The oil cakes can be they have the rich in nitrogen, phosphorus, potash and the many other nutrients or the. So, organic matter containing a higher percentage of essential plant nutrient such as nitrogen, phosphorus, potash as compared to bulky organic manures is a concentrated one made from raw materials of the animals or the plant origins.

So, these are the plant origins are the oilcakes or the animal origins are the blood meals or the bone meals are the hoof meals. So, they are rich in the blood meal, blood meal are rich in chlorine nitrogen contents which can meet the then requirement of the crop to large extent, bone meals or the hoof meals so, these are the rich in your phosphorus calcium and the magnesium contents. So, for the permitting the require requirement of the crop. So, these are the concentrated manures can be produced.

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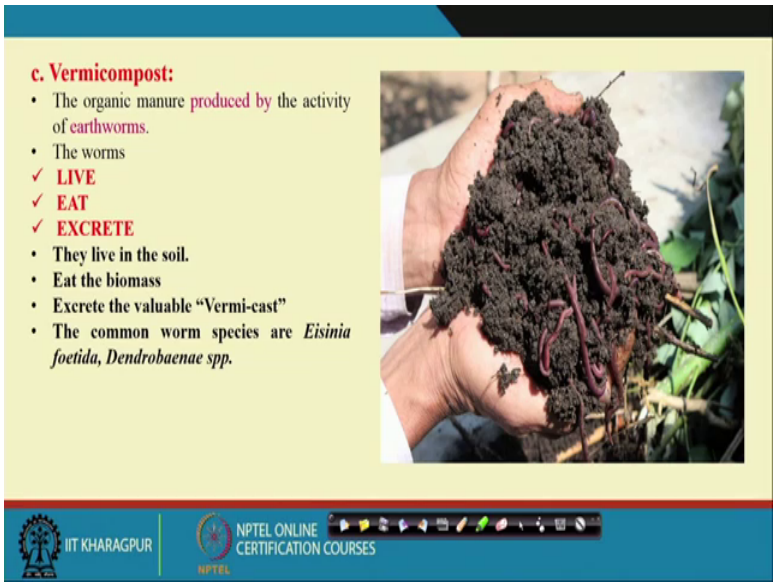

And vermicompost we will be dealing largest number vermicompost production. So, this is one of the integral part of the organic farming whereby the earthworms that play major roles in decomposing the waste materials. So, they do earthworm they do live, eat and excrete, so they live in the soil also they eat the biomass they in the biomass and they are excrete is rich in humus. And the excrete of the earthworms the humusand many of the antibiotics as a inside the act as a insecticides and the pesticides and also they have provide the many harmones that required for the growth and development of the crops.

And also the rich in many enzymes they are used in the crop production process. So, the common earthworm species there you see the eisinia foetida or the dendrobaenae spp with there are many of the species are there where eisinia foetida is a very common. This can be used in a wide range of temperature specially for tropical climates, used a eisinia foetida you can survive from temperature around from 5 degree celsius to 45 degrees celsius.

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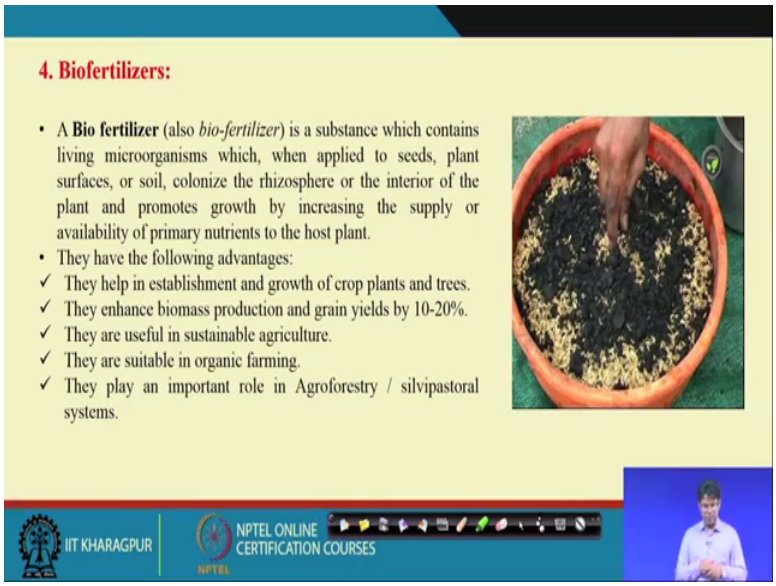

And bio fertilizer as this bio fertilizer these are the living microorganisms their life or the or maybe a cells of the nitrogen fixing phosphate cellulizing and the cellulitic micro organisms.

So, when they are applied to soils they colonize the rhizosphere or the interior of the plants and promotes growth by increasing the supply of availability of primary nutrients to the host plants. So, they have the advantages means the bio fertilizer they help in establishing. And the growth of the crop plants they also the large trees they enhanced biomass production on grain yield by 10 to 20, because these are the this the we are using the organisms like the nitrogen fixing organisms phosphor cellulizings and the cellulitic microorganisms are there in bio fertilizer.

So, they help in the nutrient release pattern from the soil some. So, they help in increasing the available nutrients because there may soil maybe high nitrogen, but there may be less available. Similarly phosphorus also more phosphorus in many soils they are rich in phosphorus. If you go for a available phosphorus are very low because of the less microbial populations they help in the releasing the total converting to the phosphorus to mineralizing phosphorus.

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So, they are useful for in say sustainable agriculture they are suitable they are most take part in organic farming they play an important role in agroforestry or the silvi pastoral systems. So, there are different type of bio fertilizer we can say the symbiotic and non-symbiotic or the asymbiotic n fixations was symbiotic bio fertilizer these are the rhizobium and the mycorrhizae. So, rhizobium it colonizes the roots of specific legumes to form tumors like growth called the root nodules the form the like the root nodules.

And the rhizobium legume the association symbiotic association with the legume plants they fix the atmospheric nitrogen; the nitrogen is converted to ammonia, and the fixation can be up to a 100 kg or (Refer Time: 17:00) 300 kg nitrogen per hectare from one crop seasons depending upon the rhizobium on the legume association. Mycorrhizae also mycorrhizae are the symbiotic association of fungi with roots of the large trees vascular plants they can have the; they can solubilize the phosphorus availability for the crops mycorrhizae vascular or vascular mycorrhizae.

Then asymboitic the free living bacteria; so they do not depend upon the host plants for there the food so these are the they can live in the free environments and they can add a significant amount of nitrogen into the soil. So, they grow on decomposing soil organic matter and produce nitrogen compounds for their growth. And the developments and they leave behind the significant amount of nitrogen in the soils. So, those are three living the azotobacter, azospirillum (Refer Time: 17:53) also blue green algae and as well

as. Because those free living microbes they are; they used for this especially cereal crops or rice or the wheat post crops who use this free living bacteria. So, that they can fix they can help in fix some of the atmospheric nitrogen.

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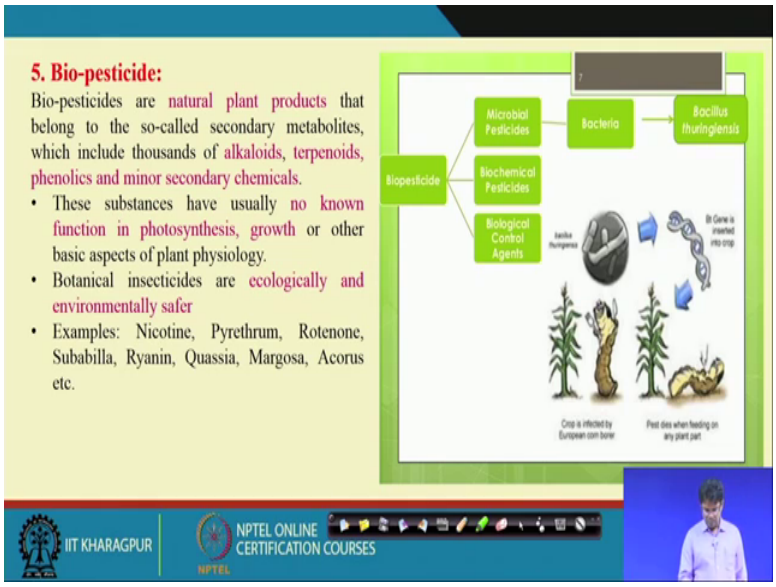

See the bio pesticides, so these are the bio pesticides as you see the are natural plant products that belong to the so, called a secondary metabolize because see I it will discuss the how the pesticide formations how you can make pesticide from the naturals plant of plant origins. So, these are the alkyl which includes the thousands alkaloids terpenoids, phenolics and minor secondary chemicals.

So, they are used for the manufacture of the bio pesticides also use the a meterials like your the cow dung, cow urine also for making the bio pesticides. So, they the botanical insecticides are ecologically and environmentally safers like some examples like nicotine, pyrethrum, rotenone, subabilla, ryanin and quassia. So, these are the compounds they are present in the plants and they are dragons the pest and diseases.

The thing that we want to propose here; so, these are the some of the components of these organic farmings the question; at the end I want to say why organic farming is say that organic farming is a better quality the food quality of a organic produce that the better as compared to chemical produce; if you see the nutrient release pattern of the soils or nutrient uptake pattern from the soil.

If you see this one whether you apply the organic fertilizers or this chemical fertilizer suppose you take the example of the nitrogen, the nitrogen the farm of a nitrogen taken of the crops either the ammonium farm or nitrate farm.

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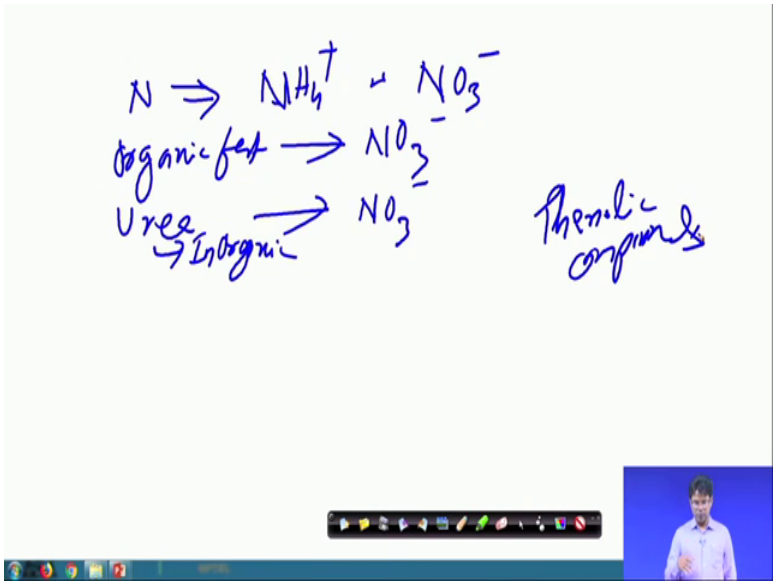

Most of the crops they do prefer to have the nitrate farm ammonium farm only by rice. So, many crop plants they do take the nitrate farm. So, you apply your organic fertilizer that is converted to after the mineralization process it is converted to nitrate, if I apply the urea that is a chemical fertilizers.

So, after a hydrolysis and nitrification this is also converted to nitrate. So, the nitrate is the farm of nutrients that is taken up by the crops it can come from the organic source it can come from the non-organic. So, this is one the, you can say as in organic or a non-organic or chemical. The question is the question is so, the question is the plant test nitrate from the soil whether we apply organic fertilizer or the in inorganic fertilizer. Then how does the quality of the organic produce are better as compared to chemical produce.

So, the see if you go for the yield improvement for the production improvement nitrogen has a major role. If you think of the quality of the crops like your secondary metabolites, we can say one is the antioxidants like ascorbic acids or the phenols, phenolic acids you can say. So, they come not the so, what are the elements responsible the secondary

metabolites formations in the plant body of course, the micronutrients play some major roles for the formation of a secondary metabolites or the quality of products.

So, in addition to that there is another mechanism which is a responsible for the for increasing the quality of the production that is a called as a nutrient release pattern. In case of chemical fertilizer there is a instant release of nutrient and we are applying in specific intervals the regular intervals. So, that the crop gets nutrients suppose rice crops we are apply three or three splits of nitrogen are critical grow stages.

So, plant gets nutrients at the time of requirement, so gives a good productions. So, plan does not go for any stress does not suffer from any stress, but the same rice crop if we use the inorganic fertilizers like compost usually apply a compost as a (Refer Time: 23:03) one time, but; however, we have seen that we can apply split those are true, but think that for the organic fertilizers I compost. So, nutrient glitch pattern is a very, very slow as compared to inorganic urea. So, it may not meet the requirement of the crops, exact requirement of crops at the critical stages.

When the organic fertilizer is not able to meet the requirement of the crops at the critical stages the plant grows under stress. So this stress physiology, when the plant grows under stress due diffusivity of nutrients because of this stress so, there is more formation of secondary metabolites which does not happen in case of inorganic fertilizers. So, like the phenolic compounds the secondary metabolites that is phenolic compounds formations.

So, these are a higher in case of the organic farming if we are going for the organic way of input managements. The yield may be slightly lower, but the quality is better because there are the phenolic compounds or the polyphenols formations are higher in case of the organic nutrient managements are the plant grows under stress. So, there is a secondary, secondary metabolites that leads to quality the better quality of the productions as you see the antioxidants or the ascorbic acids so many fruits, vegetables, real crops they have the all the bitamines or the minerals, so those are higher in organic products.

So, that is why the products of a organic farming. So, they are the more in so if you go for the tomato like. So, there are different lycopene its content is higher if you grow tomato organically as compared to in organic or the chemical farming. So, a lycopene formations or the ascorbic acids in case of the corn or the polyphenols in case of the tea.

So, those things say a organic tea has a higher polyphenol contents as compared to conventional tea.

So, that way the organic farming or the produced from the organic way of managements has a better quality having higher secondary metabolites. So, that does because having polyphenols if you take the more polyphenols they has a they have a anti-aging effects. And also they do not allow the formation of free radicals in the plant in the human body, because in case of human body there is a formation of free radicals either due to stress or the food habit.

But taking the regular antioxidants they can neutralize the formation of free radicals and free radicals mainly they cause cell damage and cancer. So, those chronic disease can be avoided if you take the regular antioxidants. The body also secretes some antioxidants, but they may not be enough we have to take natural antioxidants. And if you take a organic foods they are rich in a antioxidants as compared to your the chemical foods.

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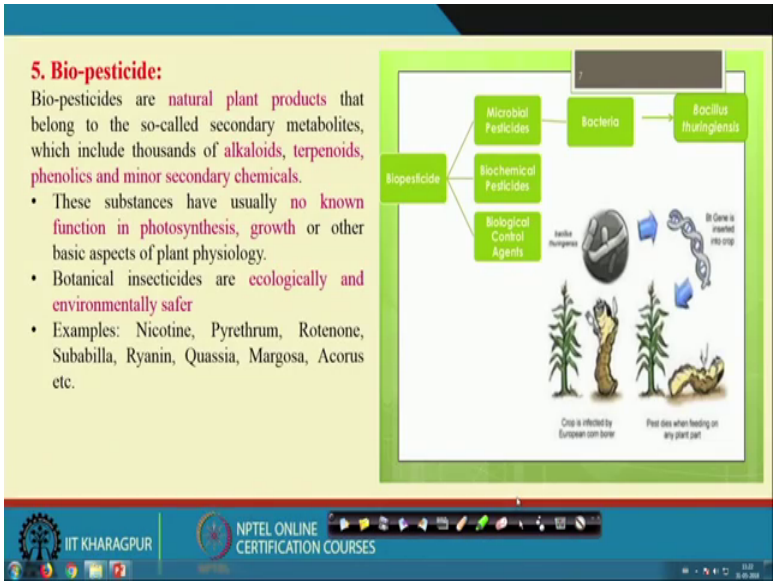

So this organic farmings as you as you say we can. In case of the organic farming we can have the better produce and the better quality of the crops and with the better with the better environment.

Thank you all.